2005 Funded Projects - *Monday, August 23, 2004 at 14:52*

Production Agriculture Projects

Commercialization of BmJ as a Broad Spectrum Microbial Plant Disease Control Agent (Montana State University, Bozeman)

The spore forming bacteria Bacillus mycoides isolate BmJ has been shown to provide effective control of the disease Cercospora leaf spot of sugar beet in multiple trials performed by Montana State University. This bacteria reduces disease by inducing the plants' own resistance mechanisms and making them less susceptible to pathogen attack. This disease reducing activity has also been demonstrated for anthracnose and angular leaf spot diseases of cucumber. The purpose of this project is to develop a commercial product utilizing BmJ as a biological fungicide for foliar diseases of sugar beet and cucumber, and identify other high value crops where BmJ can be used for disease control. One particular target is the black sigatoga leaf spot of banana. This is the largest single fungicide market in the world. Funds from the Montana Board of Research and Commercialization Technology will be used to develop production and quality control methods for BmJ, gather information to be used in application for permits from the Environmental Protection Agency, and demonstrate BacJ induced disease resistance and disease control in high value crops.

Commercialization of Enhanced Plant Protein for Aquaculture Diets: Production scale-up and trout growth studies (Montana Microbial Products, Missoula)

This project addresses key issues in commercial development of a process to improve the nutritional value of grains and oil seeds for use in feed for farmed trout and salmon. The improved crops would replace fishmeal now used in trout and salmon feed. Each year, aquaculture, including trout and salmon farming, uses more than 2 million tons of fishmeal - dried, ground ocean fish. The use of fishmeal creates pressure on ocean fisheries, water pollution, and economic problems for fish feed manufacturers and fish farmers. Fishmeal provides the high protein and energy required by carnivorous fish such as salmon. Grains and oil seeds, such as barley, canola or soybeans, contain starches and sugars that trout and salmon cannot digest and do not have high enough protein concentration to replace fishmeal. In this project, Montana Microbial Products (MMP) works with Tech Ranch at MSU, the Bozeman Fish Technology Center of the US Fish and Wildlife Service and the USDA Agricultural Research Service. MMP developed a fermentation process using a naturally occurring fungus to increase the protein concentration and nutritional quality of oilseeds and grains to replace fishmeal used aquaculture. With the MBRCT grant, the project team will move to pilot scale production and trout feeding studies. Worldwide, trout and salmon farming consumes some 800,000 tons of fishmeal per year. Commercializing this technology would create a new value-added agricultural process industry and new markets for Montana crops.

Potential Health Application of Sugar Beet Fiber (Deaconess Billings Clinic Research Center, Billings)

This project will define several potential health applications of sugar beet fiber. The

project will determine if fiber from sugar beets can be used to reduce cholesterol and slow the uptake of carbohydrates in the body and their conversion to glucose. This could favorably impact the management of diabetics. Currently the sugar beet fiber from Montana producers is sold for animal feed, and the crop yield has been optimized. The sugar beet industry in Montana has been impacted by a series of declines in world sugar prices and will be further squeezed by the planned increase in allowed importation of Central America cane sugar. By finding more uses for by-products of the sugar beet, the crop value can be less sensitive to the world or U.S. sugar market conditions. If the studies are positive, it may be economically feasible for our sugar beet processors (or new Montana companies) to produce a high quality sugar beet fiber for use in the human diet.

Other Projects

Imaging Studies to Test the Efficacy of Targeted Multi-Photon Photodynamic Therapy for the Noninvasive Treatment of Cancerous Tumors (Montana State University, Bozeman)

Photodynamic therapy (PDT) is an approach to killing cancer, and other unwanted cells, that utilizes a photosensitizer activated by laser irradiation. A process somewhat akin to serious sunburn kills cells that have taken up the photosensitizer. Photosensitizers currently approved for use on patients can only be used at very shallow depths under the skin, and they can leave the patient sensitive to sunlight for several weeks. These drawbacks severely limit the use of PDT for the treatment of tumors below the skin surface. A novel class of photosensitizers which can be used at depths of several centimeters, and which results in residual sensitivity to the sun of only a day or two, has been developed. The work to be undertaken with this award will demonstrate the efficiency of PDT using novel photosensitizers on human cancers growing in immunodefficient mice. Tumor growth will be monitored using in vivo optical scanning, a recently developed approach to preclinical studies which uses far fewer animals and provides much more relevant information. Completion of these proposed studies will provide the data needed for a future submission to the FDA for approval of human trials.

New Fluorescent Dyes for Ultrasensitive Multiplex Detection in Proteomics, Biotechnology and Diagnostics (Montana State University, Bozeman)

Genes contain the directions for organisms to make proteins and the proteins do virtually all of the work in cells. Proteomics is the study of the proteins produced by cells, the vast number of modified forms of these proteins, and the protein-protein complexes found under different physiological conditions. Rapid growth in information about the genes in organisms has been propelling a revolution in proteomics; however, the tools currently available are far from sufficient to realize the full potential of proteomics to separate and identify all of the proteins and modified proteins that are implicated in different biological processes, to inform individualized nutrition, or to guide drug design. The broad goal of this project is to provide the foundation for commercialization of an innovative family of ultra-sensitive fluorescent detection dyes and a multiplex measurement system, based on the new "Zdye" family of dyes devised at Montana State University. Multiplexing is the measurement of many different signals simultaneously, in this case from groups of proteins that are present under different physiological conditions and are labeled with different colored Zdyes and mixed before separation--so that protein abundance ratios can be determined after separation by laser excitation of the different Zdyes. The innovative Zdyes to be synthesized and tested during this project promise to provide much more powerful tools for rapid proteomic screening of an enormous number of proteins, for pinpointing the proteins that are altered in health or disease conditions of interest, to enhance understanding of the underlying biological and disease mechanisms,

and provide new means for more specific diagnostics. This project will demonstrate enabling technology that promises to have an outstanding competitive advantage in proteomics, biotechnology and diagnostics. The dyes to be produced in Bozeman will provide small volume, high value, marketable products that have excellent potential to advance scientific knowledge in many areas of biological research and lead to benefits to society by improving human health.

A Commercial Software Package to Develop Fuel Maps From High-Resolution, Remotely Sensed Data (Yellowstone Ecological Research Center, Bozeman)

With more people moving into the urban/wildlands interface, property risk and loss due to wildfire have grown precipitously in the Western United States. Concurrently, fire-fighting costs have ballooned and now hover around one billion dollars per year. The Yellowstone Ecological Research Center's project (YERC) of Bozeman seeks to assist private parties and public land managers by providing improved maps showing the location, loading, and moisture content of hazardous forest fire fuels. These maps will be based on proprietary software algorithms developed by YERC spatial analysts and applied to high technology, remotely sensed data (sourced from satellites or airborne platforms). Fire fuels maps derived from YERC's work will be a great benefit to the assessment of forest fire risk, to the development of pre-fire risk reduction programs, and to guide post-fire restoration efforts. Chief markets for this work will be private and public land managers, and the insurance industry.

Nontoxic, Alkaline Sulfide Lixiviants for Recovering Gold from Montana Ore Bodies (Montana Tech, Butte)

This project focuses on further development and application of an environmentally responsible gold leaching lixiviant that is nontoxic and has the ability to recover gold from orebodies located in Montana. The process is based on the use of alkaline sulfide solutions as lixiviants to recover gold from various types of ore/concentrates found or produced in Montana. This project will lead to development and implementation of a process with optimized conditions for recovering gold. The advantages of this process are its ability to affectively leach and recover gold without the use of highly toxic lixiviants such as cyanide. Additionally, the proposed process does not produce any hazardous byproducts. Rather, residual lixiviant can be reused or treated to produce value added products that can be used in related Montana industries such as agriculture or pulp and paper. Furthermore, a successful project has the potential to rejuvenate the gold mining industry in Montana resulting in high paying jobs and increased tax revenues.

Development of a Nerve Stimulation System for Clinical Use in Regional Anesthesia and Pain Management (Nervonix, Inc., Bozeman)

The public is becoming better informed regarding the advantages of regional anesthesia for surgery while, at the same time, clinicians are increasingly recognizing the involvement of peripheral nerves in chronic pain syndromes. As a result of these trends, there are approximately 25 million procedures involving peripheral nerve block performed annually in the U.S. These market demands necessitate the development of improved diagnostic and therapeutic equipment for clinicians. This project relates to the prototyping of such a medical device. Nerve stimulation systems localize nerves beneath the skin surface and enable the accurate injection of local anesthetics next to nerves. The commercial systems available for clinical use require that three simultaneous operations be performed: (1) stabilizing the stimulating needle, (2) operating the output controls of the stimulator, and (3) injecting local anesthetic. As a consequence, use of

these systems requires either an assistant or two hands and a foot pedal, neither of which is ideal. Additionally, the electrical outputs of the stimulation devices in clinical use are not optimal and contribute to the incidence of failed nerve blocks. This project addresses all of these issues by improving the electrical design of the stimulators and incorporating the output controls in the hub of the disposable stimulation needle. Consequently, the operator can reliably perform regional anesthetic procedures using two hands without the additional expense of an assistant.

Enhancement of Applied Research in Biomedicine (University of Montana, Missoula)

The MBRCT Award to the Center for Structural and Functional Neuroscience at the University of Montana will be utilized to aid the development of an applied biomedical research program in Montana that holds the greatest potential to positively impact the state's economy. This five-year project, which is now entering its fourth year, was designed to complement the basic research effort supported by the National Institute of Health (NIH) Center of Biomedical Research Excellence (COBRE) grant to the University. The intent of the project is to help provide the infrastructure and resources that are needed to create a research environment in Montana that will promote the development and success of biomedical/biotech companies. Thus, the project supports: university and university/private sector collaborative projects in applied and translational research, the maintenance and staffing of shared high-cost, high-tech equipment facilities that are available to on- and off-campus users, student training, and researcher education and administrative support in technology commercialization. The scientists participating in this effort include those in the Neuroscience Center, as well as those regional hospitals, such as St. Patrick Hospital and Health Sciences Center, and Montana-based biotech companies, such as MedIntel Inc. and NanoMed Technologies. The specific goal of these private sector collaborations is to use the scientific expertise and resources available within the Center to aid in the design and commercialization of technology, particularly as related to the development of novel diagnostics, devices and/or therapeutic agents used in the treatment of degenerative diseases and disorders of the nervous system, such as stroke, brain tumors, or spine injury.